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Using Educational Theories for Modelling a Computer-based Distance Learning Platform

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Abstract

This paper aims to computer-based platform designs and implementations for distance learning. Nowadays, remote education is becoming universally used. Several advantages of distance learning, such as access to learning, elimination of time and space aspect, are important features that have facilitated its utilization. Most designs of distance-learning computational platforms are not based on pedagogical aspects, learners' features, and learning theories. Generally, scientific researches concerning actual learning are based on well-known educational theories. However, there are much less research efforts concerning the application of these theories on computer-based distance learning platforms.

In this paper we propose modeling tools applicable to designs of computer-based platforms. The learning technological resources presented here are supported by educational theories. We do an analysis of several distance-learning platforms facilities and we discuss about theoretic pedagogical supports that could be applied using these facilities. We also propose supplementary tools to the platform: these tools can act directly in difficulty attenuation of computer-based distance learning problems.

keywords

Distance learning; design of computer-based distance learning platforms; learning theories.

Introduction

In this paper we present general guidelines for the elaboration of computer-based learning platforms to be used through the Internet. The resources of this kind of platforms are based on some educational theories. We discuss about the tools more commonly used in those kinds of environment and we also suggest additional technological resources that are supported by educational theories. Our central idea is to look for pedagogic theoretical supports already in use in presence learning in order to apply them in remote learning.

Motivation

Distance learning is not a recent strategy of teaching. Although the first effort concerning distance learning could be seen as the "Correspondence Study" (a series of "scientific news" wrote and sent by peoples in the beginning of the 17th century), it is actually, we can consider that only in the 20th century - in fact around the thirties - it appeared a more formal registration of the distance education activities, done in several scientific areas, both in the technical education and professional training.

In the last century, until the eighties, we have used "mail" as way of information's exchange, characterizing the beginning of an effective distance education.

This includes the effective use of distance learning for professional associations, such as American Association of Medical Record Librarians and the Chartered Association of Certified Accounts Educational Trust, this last one being the issuer of the Certified Accountants Educational Trust (Lima, 1999).

In Brazil, the Brazilian Universal Institute was created in the year 1941, whose offers distance-learning courses for correspondence. In 1947 it was made the first experience of course by radio waves at *Universidade do Ar*, promoted by the National Service of Commercial Learning. The company *Abril Cultural* has published in 1967 the encyclopedia *Conhecer*; the Ministry of the Education has developed *Funtevê*; and the government from *São Paulo* State has put on air the *Rede Cultura*. The Brazilian National Center of Researches (CNPq) has created in 1987 the *Universidade do Vídeo*. In 1996 the first experience of videoconference has happened through Internet, in Federal University of *Santa Catarina*; and in 1997 the Ministry of the Education has developed the project *Proinfo* (Especial, 2001).

So, the increasing offering of computer-based distance learning courses has required an increasing demand of computer-based platforms as technological aid to support those courses.

Related aspects to computational environment aimed to distance learning

We discuss in this section important aspects to be observed in computer-based learning environments focused to distance learning courses through Internet.

Learning theories

Learning theories look for recognizing the involved dynamism in teaching and learning activities. The main idea concerns recognition of cognitive evolutions, and it tries to explain the relationship between the preexistent knowledge and the new one. The learning could not be intelligent and knowledge constructive, but the main preoccupation is based on a basically personal identification and relationship concerning in interactions among the individuals (Santoro et al, 1998).

The computational environment, destined to distance learning, should focus pertinent factors to the human's mediation through the technology. The learning theories have in common the fact that they assume individuals as active agents searching knowledge. In the following table, we summarize main characteristics of learning theories.

Learning Theories	Characteristics
Piaget's Genetic Epistemology	Central point: cognitive structure of the individual. The cognitive structures change through the adaptation processes: assimilation and accommodation. The assimilation involves the interpretation of events in terms of existent cognitive structures, while the accommodation refers to the change of the cognitive structure to understand the habitat.
Bruner's Constructivist Theory	Learning is an active process, based on its previous knowledge and the ones that are being studied. The learner filters and transforms the new information, inferring hypotheses and making decisions. He is an active participant in the knowledge acquisition process. Instruction is related to contexts and personal experiences.
Vygotsky's Social Cultural Theory	Cognitive development is limited to a certain potential for each interval of age (zone of proximal development - ZPD). The individual should be inserted in a social group and he learns the one that its group produces. The knowledge appears first inside the group before being assimilated by the individual.
John Bransford and the CTGV Theory: Learning based on Problems / anchored Instruction	Learning begins with a problem to be solved. Learning is based on technology. The learning and teaching activities should be created around an "anchor", which should be some type of case study or a situation involving a problem.
R.Spiro, P. Feltovitch & R. Coulson: The Cognitive Flexibility Theory	It deals about the skills and knowledge's transfer. It is especially issued to give a support to the use of interactive technology. Learning activities need to supply different content's representations.
J. Lave's Situated Learning	Learning occurs in function of the activity, context, culture and social environment in which the learner is included. Learning is strongly related to practice and it cannot be dissociated from it.
Gestalts	It emphasizes the perception instead of the reply. The answer is considered as the sign that the learning happened but not as integral part of the process. It does not emphasize the sequence stimulus-response, but the context or field in which the stimulus occurs and the insight originates.
D. Ausubel: Inclusion theory	The most important factor of learning is it that the student already knows. In order to happen the learning, important and inclusive concepts should be clear in the individual's cognitive structure. Learning happens when new information anchors itself in preexistent concepts or important proposals.
C. Rogers: Experimental Learning	One should always look for experimental learning. Interest and motivation are essential for the well-happened learning. It emphasizes the importance of the interaction aspect of learning. Teacher and student appear as the co-responsible persons in the learning process.
Gardner: multiple learning	In the teaching process, we should try to identify the most evident intelligences in each learner, trying to explore those intelligences in order to reach the final objective: the learning of a specific content.

Table 1 – Learning Theories

Guidelines to an ideal environment

Based on some computer-based distance learning experiences, we propose some additional characteristics that could be in an ideal platform to computer-based distance learning.

Research Mechanism

The learner should have opportunity to develop its own researches and not be restricted to an explanation or available instructional materials. In agreement with the constructivist theory, the learner should build his/her own knowledge aided by teacher's orientation but not receiving it already done.

Dynamic Elimination of non-active links

The platform must do a dynamic verification of the allowed links when the student is connected to the Internet choosing a topic. Links associated to the selected topic are verified; being exhibited just the active ones.

Intelligent search's mechanism

Available materials and links do not facilitate the research to be done by learners in order to complement their researches or to perform some tasks. Nowadays, the available search tools are still quite limited, just finding documents containing the wanted words, but without any concern with the context in which they are being researched.

Automatic events search

During a connection, the learner could be automatically informed about events related with his/her studied subject (chats, video conference, etc.) the ones which are happening in real time. The proposed tool must look for the synchronous events, running as an appointment book, but it would not be restricted to events pre-determined by the teacher.

Interaction

A distance-learning platform must own interaction mechanisms for all its users. This statement is based on the learning humanists' theories. Rogers, Lave and Vygotsky, for instance, agree with the fact that "the social interaction exercises a role of great importance in learning, which can be enviable in its absence".

Video and sound in real time

According to Hara and Kling (2001), the written language is inherently ambiguous, which brings a communication problem for the distance learning. Besides, (Chaves, 2001) affirms: "the visual contact with students is the best part of the presence/traditional education". In order to minimize this problem, we suggest a tool that facilitates the interaction through video and sound in real time.

Blackboard

We propose some schedules for synchronous meetings in order to exercises' resolution, where the students possess a writing area, being visualized at the same time by the teacher and other students.

Presentation of content and evaluation

Tests and self-evaluation

The use of self-evaluations is referred in the Rogers' Experimental Learning theory of as a measure of the learning. Besides the traditional forms of evaluation, where the student accomplishes tasks and sent to the teacher, he could use the facility of having tests proposed aimed to self-evaluation of his own knowledge.

Several media types

In agreement with the C. Gardner's Multiple Intelligences Theory, each learner has specific skills or kinds of developed intelligences. So a computer-based platform should facilitate the visualization of content in several ways, such as graphs, texts, illustrations, videos, etc. The learner could have the option of consulting the more appropriate visualization form for him.

Pre-requirements and the difficulty level availability

Ausubel indicates the use of previous organizers, which are introductory material to the subject to be taught. Based on this kind of theories, contents and exercises should be presented in a such way that the degree of difficulty increases gradually. The knowledge assimilation is based on Vigotsky' Social-Cultural Theory and ZDP.

Use of simulators

We could couple simulators into the computer-based platform, whenever the approached content allows it. Such simulation aids the students' visualization in a practical application of the knowledge, which is supported by Roger's Experimental Learning Theory and Lave's Situated Learning Theory. In agreement with those authors, the learning should not be dissociated of the practice and the student will learn easier visualizing the concrete application of the knowledge.

Conclusion

In this article we made a summary about distance education around the world, including Brazil, highlighting the increasing computer-based distance learning courses. We have also pointed out that the platform's designers rarely consider the pedagogical aspects and learning theories, preferring emphasizes technological aspects. Based on this approach we elaborated a table pointing out the main aspects of some learning theories under the optics of the computer-based learning. According to this table, we have also looked for pedagogic theoretical supports for the presence of functionalities more commonly found on that kind of platforms. The idea is to propose a set of technological resources available, turning learning process more productive.

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